

What is claimed is:

1. A method for determining formation fluid pressure in earth formation surrounding a borehole, the borehole defining a borehole wall, the method comprising:
 - pressing a probe into contact with mud cake and formation at the borehole wall;
 - expanding the volume of a variable-volume pretest cavity that is in fluid communication with the probe during a draw-down period to break a mud cake seal at the probe;
 - terminating expanding the volume of the cavity on detecting a break in the mud cake seal;
 - allowing a build-up period to establish pressure equilibrium between tool fluid and formation fluid;
 - measuring tool pressure; and
 - setting formation fluid pressure equal to tool pressure at pressure equilibrium.
2. A method according to claim 1, wherein detecting a break in the mud cake seal includes measuring tool pressure and detecting an abrupt change associated with tool pressure.
3. A method according to claim 2, wherein detecting the abrupt change includes using a finite moving average (FMA) algorithm on a function of tool pressure.
4. A method according to claim 3, wherein the function of tool pressure includes tool pressure.
5. A method according to claim 3, wherein the function of tool pressure includes a first derivative of tool pressure.
6. A method according to claim 3, wherein the function of tool pressure includes a second derivative of tool pressure.
7. A method according to claim 1, wherein detecting a break in the mud cake seal includes detecting a difference between a measured tool pressure and a corresponding tool pressure from a reference tool pressure profile.
8. A method according to claim 7, wherein the reference tool pressure profile is measured in a previous drawdown with the cavity isolated from the formation.

9. A method according to claim 1, further comprising:
 - expanding the volume of the cavity during the draw-down period at a predetermined constant rate.
10. A method according to claim 9, wherein the predetermined constant rate is within the range of 3-160cc/minute.
11. A method according to claim 10, wherein the predetermined constant rate is approximately 5cc/minute.
12. A tool for determining formation fluid pressure in earth formation surrounding a borehole, the borehole defining a borehole wall, the tool comprising:
 - an elongated body adapted for downhole operation;
 - a probe, extendable from the elongated body, the probe defining an inflow aperture;
 - a pretest piston pump defining a variable-volume pretest cavity;
 - a pretest flow line coupling the inflow aperture to the cavity;
 - pressure measuring means, pressure-coupled to the cavity for measuring tool pressure; and
 - electromechanical control means for controlling the volume of the cavity.
13. A tool according to claim 12, wherein the control means includes an electromechanically driven roller screw planetary system.
14. A tool according to claim 13, wherein the control means further includes an electrically driven gearbox coupled to drive the roller screw planetary system.
15. A tool according to claim 12, wherein the control means includes downhole programmable control electronics coupled to control the electromechanical control means.
16. A tool according to claim 12, wherein the tool includes a constant-volume flow line.
17. A tool according to claim 16, wherein the constant-volume flow line includes a dedicated probe.
18. A tool according to claim 16, wherein the constant-volume flow line includes a flexible conduit.

19. A tool according to claim 16, wherein the constant-volume flow line has a volume in the range 20 - 120cc.
20. A tool according to claim 12, wherein the probe is located between the pressure measuring means and the variable-volume pretest cavity.
21. A tool according to claim 12, further comprising a sample line coupled to the cavity, and an isolation valve located between the cavity and the sample line.
22. A tool according to claim 12, further comprising an isolation valve located between the cavity and the formation fluid inflow aperture.
23. A tool according to claim 12, wherein said electromechanical control means includes means for terminating expansion of the volume of the cavity on detecting a break in a mud cake seal.